



National Aeronautics and  
Space Administration

SA-02-98



# Langley Research Center Safety Alert

Date: July 6, 1998

TO: All LaRC Employees


FROM: Head, Office of Safety and Mission Assurance

SUBJECT: Cadmium-plated High-Strength Bolts Used in High Temperature Applications

The purpose of this Safety Alert is to inform all LaRC personnel of potential bolt failure where high-strength cadmium-plated bolts are used in high-temperature applications (temperatures above 450° F).

During the re-installation of a piece of hardware at the 8-Foot High Temperature Tunnel (8'HTT), several grade 8 high-strength cadmium-plated hex head bolts failed as technicians were tightening the bolts with a torque wrench. The failed bolts used for the re-installation of the hardware had been through numerous thermal cycles during testing at the 8'HTT. Analysis of the failed bolts indicated that the bolts met all metallurgical specifications. Failure patterns suggested a fatigue fracture where the head of the bolt meets the body. Research has found that high-strength cadmium-plated bolts should never be used in applications where the temperature will exceed 450° F. If the temperature exceeds this recommendation, liquid metal embrittlement can occur that adversely affects the mechanical properties of bolts and leads to failure. The bolts at the 8'HTT had been exposed to temperatures well in excess of 450° F.

LaRC personnel are being asked to examine all equipment (in use or under design) at LaRC that could be exposed to temperatures in excess of 450° F for cadmium-plated bolts. Any cadmium-plated bolts found in such applications should be removed and replaced with bolts having an acceptable coating, such as black oxide. The RI&QA lab is available to assist in determining if a bolt is cadmium-plated and identifying an acceptable replacement. Questions concerning this Safety Alert should be directed to Harold Beazley at 43368.

  
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